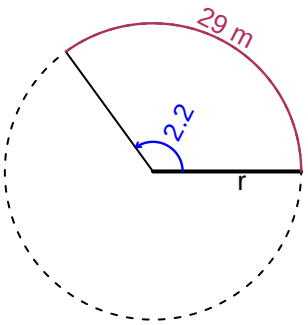
Name: Date:

Trig Final (SLTN v683)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 29 meters. The angle measure is 2.2 radians. How long is the radius in meters?

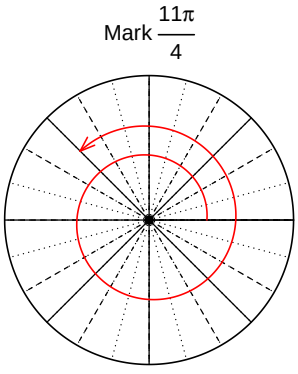


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

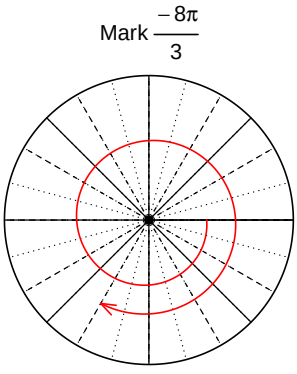
$r = 13.18$ meters.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(11\pi/4)$



Find $\sin(-8\pi/3)$

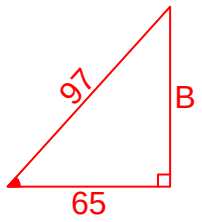
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-8\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-65}{97}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

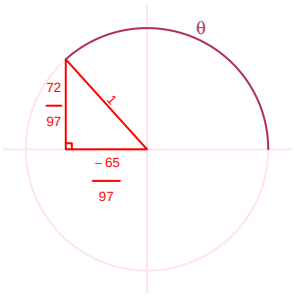
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + B^2 = 97^2$$
$$B = \sqrt{97^2 - 65^2}$$
$$B = 72$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{72}{97}}{\frac{-65}{97}} = \frac{-72}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 5.04 Hz, a midline at $y = 2.53$ meters, and an amplitude of 7.17 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.17\sin(2\pi 5.04t) + 2.53$$

or

$$y = 7.17\sin(10.08\pi t) + 2.53$$

or

$$y = 7.17\sin(31.67t) + 2.53$$